

REMARKS

In the Office Action, claims 1 and 22-40 are pending. Claims 1 and 22-40 are rejected under 35 U.S.C 103(a) as being unpatentable over Johansson, et al. (U.S. Patent No. 5,277,764), Andersson, et al. (U.S. Patent No. 5,607,552), or Keiser, et al. (U.S. Patent No. 6,486,216). This rejection is respectfully transversed.

The present invention relates to silica-based sols for use in papermaking. Specifically, the invention discloses silica-based particles and sols containing silica-based particles with high drainage and retention performance, high stability and high solids content.

Johansson discloses colloidal silica or silica sol having a S-value of 8 to 45%; $\text{SiO}_2\text{:M}_2\text{O}$ ratio of between 20:1 to 75:1, and a specific surface area of between 10 and 1000 m^2/g .

Andersson discloses aqueous suspensions of colloidal particles, which are both silica-based anionic particles and hydrated particles of clays of smectite type, which are expandable in water. The suspensions disclosed in the examples are prepared from silica sol and Na-bentonite.

Keiser discloses stable aquasol containing colloidal silica having a S-value of 20 to 50%; $\text{SiO}_2\text{:Na}_2\text{O}$ ratio of between 13:1 to 17:1, and a specific surface area of between 700 and 1100 m^2/g . The aquasols have % by weight SiO_2 levels from about 7.00 % to about 16.80 %.

Thus, Johansson discloses silica based sols or silica sol, Andersson discloses an aqueous suspension of colloidal particles, which particles are both silica based anionic particles and swollen particles of clays of smectite type, and Keiser discloses aquasol. Consequently, the references disclose different products.

A person of ordinary skill in the art trying to improve dewatering in papermaking has no reason to develop an aqueous sol containing silica-based particles having the combination of the parameters defined in the present claims and there is no disclosure, suggestion or teaching in the

cited art, alone or in combination, regarding how to produce such a product. It was stated in the Office Action that “since viscosity is dependent on such factors as particle size and surface area, it is obvious that since the S-values and specific surface area of the above prior art sols are within the claimed range, the prior art obviously encompasses the claimed viscosity”. This is not true.

The different parameters of an aqueous sol containing silica-based particles are not independently changeable. For instance, in prior art products, it is generally not possible to increase the silica content and, hence, the viscosity of an aqueous sol containing silica-based particles without risking aggregation and precipitation of the contained silica-based particles. Usually, this also affects the specific surface area of the contained silica-based particles. In addition, the S-value is usually affected dramatically. The S-value is a function of silica content, viscosity and density. If the silica content is changed, then viscosity and density will also change. Further, the S-value is not applicable to aqueous suspensions of both colloidal silica-based particles and hydrated particles of clay of smectite type as disclosed by Andersson.

As admitted in the Office Action, none of the references disclose viscosities. Neither do the references disclose densities. The person of ordinary skill in the art would not be able to determine any viscosity out of the disclosed parameters, and would further not be able to combine any of the information extracted from the various references since it would require one to combine some parameters of one sol with some other parameters of a different sol.

As is evident from Example 6 of the specification, the sols according to the present invention show improved dewatering times compared to either sols prepared as standard silica sols of Example 1 or commercially produced silica sols of Example 6. For instance, Sol 4 of the invention having a SiO_2 content = 15.2 % by weight, molar ratio $\text{SiO}_2/\text{Na}_2\text{O} = 21$, S-value = 32%, specific surface area = $720 \text{ m}^2/(\text{g SiO}_2)$ and viscosity = 14.2 cP is compared to a commercial silica-based sol 6b having a SiO_2 content = 10.0 % by weight, molar ratio $\text{SiO}_2/\text{Na}_2\text{O} = 10$, S-value = 32%, specific surface area = $880 \text{ m}^2/(\text{g SiO}_2)$ and viscosity = 2.5 cP. The obtained dewatering times were for Sol 4 (present invention) = 9.4 sec. and for Sol 6b = 9.8 seconds. The result shows that the sol of the present invention has an improved effect on the dewatering time.

Standard Sols 1a to 1c were also compared to the sols of the invention. Sols 1a to 1c having the parameters of a SiO₂ content = 7.3 % by weight, molar ratio SiO₂/Na₂O = 40, S-value = 29%, specific surface area = 530 m²/(g SiO₂) and viscosity = 2.2 cP for Sol 1a; a SiO₂ content = 7.3 % by weight, molar ratio SiO₂/Na₂O = 63, S-value = 26%, specific surface area = 500 m²/(g SiO₂) and viscosity = 2.7 cP for Sol 1b; and a SiO₂ content = 5.4 % by weight, molar ratio SiO₂/Na₂O = 35, S-value = 32%, specific surface area = 690 m²/(g SiO₂) and viscosity = 1.6 cP for Sol 1c. The obtained dewatering times were for Sol 1a = 12.0, Sol 1b = 11.1 and Sol 1c = 12.0 seconds. The results show that the dewatering times of the sols of the invention are much better than for sols 1a to 1c.

For the reasons set forth above, the claimed aqueous sol containing silica-based particles according to claims 1, 22 to 40 is non-obvious over Johansson, Andersson, or Keiser, either alone or in combination. The Applicants respectfully request that the Examiner reconsider the rejection and find the claims in condition for immediate allowance.

In accordance with Section 714.01 of the M.P.E.P., the following information is presented in the event that a call may be deemed desirable by the Examiner:

Michelle J. Burke

(914) 674-5459

Respectfully submitted,

PERSSON, et al.



Michelle J. Burke

Reg. No. 37,791

Attorney for Applicants

Akzo Nobel Inc.
Intellectual Property Dept.
7 Livingstone Avenue
Dobbs Ferry, NY 10522-3408